Output tables for the test of Multiple comparisons.

December 17, 2022

1 Average rankings of Friedman test

Average ranks obtained by applying the Friedman procedure

Algorithm	Ranking
MEABC	6.5345
ABCADE	3.7069
ABCNG	5.431
SHADE	2.6379
MAPSO	2.9655
TAPSO	4.9138
MEEABC	1.8103

Table 1: Average Rankings of the algorithms

Friedman statistic considering reduction performance (distributed according to chi-square with 6 degrees of freedom: 106.341133.
P-value computed by Friedman Test: 5.7191473779028E-11.

2 Post hoc comparisons

Results achieved on post hoc comparisons for $\alpha = 0.05$, $\alpha = 0.10$ and adjusted p-values.

2.1 P-values for $\alpha = 0.05$

i	algorithms	$z = (R_0 - R_i)/SE$	p	Holm
21	MEABC vs. MEEABC	8.32728	0	0.002381
20	MEABC vs. SHADE	6.868487	0	0.0025
19	ABCNG vs. MEEABC	6.382222	0	0.002632
18	MEABC vs. MAPSO	6.291047	0	0.002778
17	TAPSO vs. MEEABC	5.470476	0	0.002941
16	MEABC vs. ABCADE	4.984212	0.000001	0.003125
15	ABCNG vs. SHADE	4.923428	0.000001	0.003333
14	ABCNG vs. MAPSO	4.345989	0.000014	0.003571
13	SHADE vs. TAPSO	4.011682	0.00006	0.003846
12	MAPSO vs. TAPSO	3.434243	0.000594	0.004167
11	ABCADE vs. MEEABC	3.343069	0.000829	0.004545
10	ABCADE vs. ABCNG	3.039153	0.002372	0.005
9	MEABC vs. TAPSO	2.856804	0.004279	0.005556
8	ABCADE vs. TAPSO	2.127407	0.033386	0.00625
7	MAPSO vs. MEEABC	2.036233	0.041727	0.007143
6	MEABC vs. ABCNG	1.945058	0.051768	0.008333
5	ABCADE vs. SHADE	1.884275	0.059528	0.01
4	SHADE vs. MEEABC	1.458794	0.144622	0.0125
3	ABCADE vs. MAPSO	1.306836	0.191268	0.016667
2	ABCNG vs. TAPSO	0.911746	0.361902	0.025
1	SHADE vs. MAPSO	0.577439	0.563643	0.05

Table 2: P-values Table for $\alpha = 0.05$

Holm's procedure rejects those hypotheses that have an unadjusted p-value ≤ 0.00625.

2.2 P-values for $\alpha = 0.10$

i	algorithms	$z = (R_0 - R_i)/SE$	p	Holm
21	MEABC vs. MEEABC	8.32728	0	0.004762
20	MEABC vs. SHADE	6.868487	0	0.005
19	ABCNG vs. MEEABC	6.382222	0	0.005263
18	MEABC vs. MAPSO	6.291047	0	0.005556
17	TAPSO vs. MEEABC	5.470476	0	0.005882
16	MEABC vs. ABCADE	4.984212	0.000001	0.00625
15	ABCNG vs. SHADE	4.923428	0.000001	0.006667
14	ABCNG vs. MAPSO	4.345989	0.000014	0.007143
13	SHADE vs. TAPSO	4.011682	0.00006	0.007692
12	MAPSO vs. TAPSO	3.434243	0.000594	0.008333
11	ABCADE vs. MEEABC	3.343069	0.000829	0.009091
10	ABCADE vs. ABCNG	3.039153	0.002372	0.01
9	MEABC vs. TAPSO	2.856804	0.004279	0.011111
8	ABCADE vs. TAPSO	2.127407	0.033386	0.0125
7	MAPSO vs. MEEABC	2.036233	0.041727	0.014286
6	MEABC vs. ABCNG	1.945058	0.051768	0.016667
5	ABCADE vs. SHADE	1.884275	0.059528	0.02
4	SHADE vs. MEEABC	1.458794	0.144622	0.025
3	ABCADE vs. MAPSO	1.306836	0.191268	0.033333
2	ABCNG vs. TAPSO	0.911746	0.361902	0.05
1	SHADE vs. MAPSO	0.577439	0.563643	0.1

Table 3: P-values Table for $\alpha = 0.10$

Holm's procedure rejects those hypotheses that have an unadjusted p-value ≤ 0.0125.

2.3 Adjusted p-values

i	hypothesis	unadjusted p	p_{Holm}
1	MEABC vs .MEEABC	0	0
2	MEABC vs .SHADE	0	0
3	ABCNG vs .MEEABC	0	0
4	MEABC vs .MAPSO	0	0
5	TAPSO vs .MEEABC	0	0.000001
6	MEABC vs .ABCADE	0.000001	0.00001
7	ABCNG vs .SHADE	0.000001	0.000013
8	ABCNG vs .MAPSO	0.000014	0.000194
9	SHADE vs .TAPSO	0.00006	0.000784
10	MAPSO vs .TAPSO	0.000594	0.007131
11	ABCADE vs .MEEABC	0.000829	0.009114
12	ABCADE vs .ABCNG	0.002372	0.023724
13	MEABC vs .TAPSO	0.004279	0.038514
14	ABCADE vs .TAPSO	0.033386	0.26709
15	MAPSO vs .MEEABC	0.041727	0.292089
16	MEABC vs .ABCNG	0.051768	0.310608
17	ABCADE vs .SHADE	0.059528	0.310608
18	SHADE vs .MEEABC	0.144622	0.578488
19	ABCADE vs .MAPSO	0.191268	0.578488
20	ABCNG vs .TAPSO	0.361902	0.723805
21	SHADE vs .MAPSO	0.563643	0.723805

Table 4: Adjusted p-values